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EXAMINER

SOUW, BERNARD E

ART UNIT

PAPER NUMBER

2881

DATE MAILED: 08/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/837,124

Applicant(s)

LIN, YING-CHUAN

Examiner

Bernard E Souw

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-18 and 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-18 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 April 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Amendment

1. The Amendment A, filed on 07/10/2003 as Paper No.4/a, in response to the first Office Action mailed 03/31/2003 has been entered. The present Office Action is made with all the suggested amendments being fully considered.

Claims 2 and 19 have been cancelled.

Independent claims 1 and 13 have been amended.

Accordingly, claims 1, 3-18 and 20 are pending in this Office Action.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Amended claims 1 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilton et al. (USPAT # 2002/0182883 A1) in view of Mullee (USPAT # 2002/0024882 A1) and Woo et al. (USPAT #2002/0131166 A1).

Gilton et al. disclose method and apparatus for detecting contaminating species on a wafer edge, as recited in the Abstract, comprising the steps:

- providing a wafer having contaminating species on a localized, or isolated, section of the wafer, as recited in the Abstract/II.2-3.

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providing a container having a cavity therein for holding a volume of solvent, which is inherent in the use of Gilton's liquid solvent recited in the Abstract/II.4-6;

positioning the wafer in the container and adjusting the wafer's position such that a portion of the wafer is exposed to the volume of solvent, as recited in the Abstract/II.4-6;

analyzing the volume of solvent and determining the contaminating species, as recited in the Abstract/II.6-7, on pg.1/[0012]/I.8-9, pg.3/[0035]/II.4-8 and on pg.3/[0046].

However, Gilton et al. do not recite the steps of providing a rotatable shaft attached to a bearing mounted in a support structure of adjustable height, mounting the wafer and positioning the wafer vertically and adjusting the bearing such that only the edge portion of the wafer is exposed to the solvent.

It is well known in the art that the edge portion of the wafer is the section most frequently being contaminated, due to handling, transport and/or processing. This is specifically disclosed by Mullee in the Abstract/II.12-15, whereby an "edge deposit" is specifically recited on line 14, whereas a contamination *to be cleaned* is specifically recited on line 13.

In particular, Mullee discloses a method for detecting contaminating species on a wafer edge, which is known in the art as being conventional in the semiconductor industries, as recited on pg.1/[0004]/II.1-10, whereby a *contaminated wafer edge* is expressly recited on pg.1/[0004]/line 14. Mullee's method comprises the steps of:

- providing a wafer having contaminating species on an edge portion, as inherently implicated on pg.1/[0004]/line 13, reciting the words "*to clean ... wafers*";

providing a container having a cavity therein for holding a volume of solvent, which is inherent in the use of Mullee's liquid solvent;

exposing the edge portion of the wafer to the volume of solvent, as inherently understood by one of ordinary skill in the art on pg.1/[0004]/II.12-15, specifically line 14, reciting an "*edge deposit*"; and

analyzing the volume of solvent and determining the contaminating species, as recited in the narratives relating to Tables I, on pg.6 &7, Table II on pg.7, and Table III on pg.7&8, whereby all tables reciting contaminating species as analyzed by an ICP-MS recited in the footnotes of the tables.

Although the step of "*providing a container having a cavity therein*" is not specifically recited by Mullee, it is inherently understood even by one not skilled in the art. In other words, the rationale to modify Mullee's method & apparatus does not have to be expressly stated in the prior arts; in the present case the rationale is reasoned from knowledge generally available to one of ordinary skill in the art (in this case, even to one not necessarily skilled in the art). *In re Fine*, 837 sF.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

This relates to suggestion/motivation in that "having established that this knowledge was in the art, the Examiner could then properly rely on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference'." *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

It would have been obvious to one of ordinary skill in the art to modify or combine Gilton's method & apparatus of cleaning and analyzing a contaminated portion of a semiconductor wafer with Mullee's specific identification of edge portion, since the edge portion of the wafer is well known in the art as being the section most frequently being contaminated, due to handling, transport and/or processing.

The rationale to modify or combine Gilton's with Mullee's does not have to be expressly stated in the prior arts; in the present case the rationale is reasoned from knowledge generally available to one of ordinary skill in the art.). *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

This relates to suggestion/motivation in that "having established that this knowledge was in the art, the Examiner could then properly rely on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference'." *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

Still, Gilton et al. as modified by Mullee do not recite the steps of providing a rotatable shaft attached to a bearing mounted in a support structure of adjustable height.

Woo et al. shows in Fig.6-10 a method & apparatus for handling semiconductor wafer W by providing a rotatable shaft (between 181 & 183 in Fig.10), as recited on pg.3/[0043], the shaft having a first end that is free (as seen in Fig.10) and a second

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end that is attached to a bearing (inherent to motor 183 mounted in a support structure shown in Fig.7).

Woo's method & apparatus further comprises:

- mounting the wafer W at a center point to the first end of the rotatable shaft, as shown in Fig.7 and Fig.10;
- positioning the wafer W vertically, as seen in Fig.7 and inherently recited on pg.3/[0043]/Col.2/ll.2-4, whereby "*horizontally*" means here "*vertically*", if considered relative to the **axis** of the rotational shaft, sample stage 130, and motor 183, as illustrated in Fig.7, whereby the limitation of adjustable height is inherent in Woo's;
- rotating the wafer W on the wafer stage 130, as shown in Fig.7 and recited on pg.3/[0043]/Col.2/ll.2-4,

The fact that Woo et al. have used the rotatable wafer mount shown in Fig.7 for a *different purpose* does not alter the conclusion that Applicant's use of a prior art device would be *prima facie* obvious from the purpose disclosed in the reference. *In re Lintner*, 173 USPQ 560.

The further fact that Woo's apparatus & method contain more elements, features, and structures capable of accomplishing more complex steps, also does not alter the conclusion that Applicant's use of a prior art device would be *prima facie* obvious from the purpose disclosed in the reference, since omission of elements and/or their functions is obvious if the function of the elements is not desired/required/intended. *Ex Parte Wu*, USPQ 2031 (Bd. Pat. App. & Inter. 1989)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method and apparatus of Mullee, or Gilton et al. as modified by Mullee, with Woo's, since to apply a fluid solvent on the edge of a wafer of circular form, it would be necessary to hold and rotate the wafer vertically, as in Woo's.

The rationale to modify/combine Mullee's or Gilton's with Mullee's with Woo's teaching does not have to be expressly stated in the prior arts; in the present case the rationale is reasoned from knowledge generally available to one of ordinary skill in the art.). *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

This relates to suggestion/motivation in that "having established that this knowledge was in the art, the Examiner could then properly rely on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference'." *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

► Amended claim 13 (apparatus claim) recites limitations directly corresponding the steps recited in amended claim 1 (method claim), each of which is rendered obvious by Mullee's apparatus, as inherently implicated on pg.1/[0004]/II.1-15, with an analyzer being recited in the footnotes to Tables I, II and III.

4. Claims 3-5, 8, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilton et al. as modified by Mullee and Woo et al., as previously applied to the amended claims 1 and 13 above.

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► All the limitations of claims 3-5, 15 and 16 are rendered obvious by Gilton et al., reciting in [0036] the solvent being comprised of aqueous hydrofluoric acid (HF) in a weight ratio of $H_2O:HF:H_2O_2 = 100:1:1$.

► Regarding claim 8, the use of ICP-MS (inductively coupled plasma – mass spectrometer) for analyzing the volume of solvent is rendered obvious by Mullee in Table I, II, and III, as recited in the footnotes, and also by Gilton et al. on pg.3/[0046], specifically on line 6.

5. Claims 10-12 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilton et al. as modified by Mullee and Woo et al., as previously applied to claims 1 and 13 above.

► Regarding claim 10, the step of mounting the wafer at a center point by vacuum means is rendered obvious by Woo et al. in vacuum chuck 185 shown in Fig.9 & 10, as recited on pg.3/[0043]/II.1-2.

► Regarding claim 11, the step of mounting the wafer at a center point by vacuum suction cup is rendered obvious by Woo et al. in vacuum suction cup 185b shown in Fig.9, as recited on pg.3/[0043]/II.2-4.

► Regarding claim 12, the step of rotating the wafer W by turning Woo's rotatable shaft by a motor is recited by Woo et al. on pg.3/[0043]/col.2/II.2-5

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► The limitation of claim 20 is a combination of those of claim 10 and claim 11, both having been previously rejected.

6. Claims 6, 7, 9, 14, 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilton et al. as modified by Mullee and Woo et al., and further supplemented by common sense and general knowledge in the art.

Gilton et al. as modified by Mullee and Woo et al. show all the limitations of claims 6, 7, 9, 14, 17 and 18, as previously applied to claims 10-12 above, except for some specific limitations to be addressed individually in the following:

► Regarding claim 6, 7, 17 and 18, the limitation to expose the edge portion less than 10 mm wide, typically about 1 mm to 3 mm, to the volume of the solvent, is already inherent in the method and apparatus of Gilton et al. as modified by Mullee, if applied to a standard 2" (5 cm) and 4" (10 cm) wafer mounted on Woo's rotational stage, this standard wafer radius being taken as an Official Notice by the Examiner.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to expose from a 5 cm to 10 cm standard wafer diameter only a small edge portion of less than about 10% to the volume of the solvent, since that much is the plausible portion that may be contaminated, as generally known in the art.

The rationale to further modify Gilton et al. as modified by Mullee and Woo et al. does not have to be expressly stated in the prior arts; in the present case the rationale is reasoned from knowledge generally available to one of ordinary skill in the art.). In

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re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

This relates to suggestion/motivation in that “having established that this knowledge was in the art, the Examiner could then properly rely on a conclusion of obviousness ‘from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference’.” *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

Note: *Gilton et al. as modified by Mullee and Woo et al.* disclose the claimed invention except for exposing the edge portion less than 10 mm wide, typically about 1 mm to 3 mm, to the volume of the solvent. It would have been an obvious matter of design choice to expose from a 5 cm to 10 cm standard wafer diameter only a small edge portion of less than about 10% to the volume of the solvent, since applicant has not disclosed that the recited edge width of less than 10 mm, typically about 1 mm to 3 mm, solves any stated problem or has any particular purpose, and it appears that the invention would perform equally well with any edge width, even if it covers a major portion of the wafer. Therefore, Applicant's step of limiting the wafer edge to an exposure width of less than 10 mm, typically about 1 mm to 3 mm, is a mere matter of design choice that is unpatentable, because it only involves routine skill in the art.

- Regarding claims 9 and 14, the limitation of providing the solvent container with an arcuate bottom formed to a radius between about 10 cm to about 15 cm is also

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already inherent in Gilton's as modified by Mullee's, if applied to a standard 2" (5 cm) and 4" (10 cm) wafer mounted on Woo's rotational stage.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the solvent container with an arcuate bottom formed to a radius between about 10 cm to about 15 cm, since that radius must plausibly (also logically) be larger than the radius of the wafer itself (5 cm), this standard wafer radius being taken as an Official Notice by the Examiner.

The rationale to further modify Gilton's as modified by Mullee's and Woo et al. does not have to be expressly stated in the prior arts; in the present case the rationale is reasoned from knowledge generally available to one of ordinary skill in the art.). *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

This relates to suggestion/motivation in that "having established that this knowledge was in the art, the Examiner could then properly rely on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference'." *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

Note: Gilton's as modified by Mullee's and Woo et al. disclose the claimed invention except for providing the solvent container with an arcuate bottom formed to a radius between about 10 cm to about 15 cm. It would have been an obvious matter of design choice to provide the solvent container with an arcuate bottom formed to a radius between about 10 cm to about 15 cm, since applicant has not disclosed that the

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arcuate bottom radius between about 10 cm to about 15 cm solves any stated problem or has any particular purpose, and it appears that the invention would perform equally well with any container's arcuate bottom radius larger than the radius of the largest wafer to be processed, in order to guarantee a free rotation of the wafer without touching the container's bottom. Therefore, Applicant's step of providing the solvent container with an arcuate bottom radius between about 10 cm to about 15 cm, is a mere matter of design choice that is unpatentable, because it only involves routine skill in the art.

Final Rejection

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Response to Applicant's Arguments

8. Applicant's arguments filed 07/10/2003 (paper no. 4/a) have been fully considered but they are not persuasive. The following is the Examiner's response to Applicant's arguments:

► Regarding Applicant's argument that Mullee's objective is only to clean the semiconductor wafer, but does not aim to analyze the contaminants, it is to be noted that such objective is not recited in the claims, neither in (original) claims 1 and 13, nor in the now cancelled claims 2 and 19, which limitations having been incorporated into the independent (amended) claims 1 and 13. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Even if such objective or intention would be contemplated, specific steps to carry out the purpose by the limitations as recited in (original) claims 2 and 19, now incorporated into (amended) claims 1 and 13, are conventional and well known in the art, while involving only routine skill in the art, and hence, principally unpatentable.

It is simply not true that Mullee's objective is only to clean the semiconductor wafer and does not have the intention to analyze the contaminants, since the contaminant species listed in Mullee's Tables I, II and III already recited in the previous Office Action are an obvious and undeniable proof for Mullee's existing interest or objective to analyze the contaminants. One would not have undergone so much efforts to do such an extended analysis if one does not have the intention to analyze. The

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Examiner would rather judge, that it is the Applicant, who has less intention or objective to analyze the contaminants, rather than Mullee, since Applicant does not provide any identification or analysis results of such contaminants in his disclosure, whereas Mullee does. In this regard, Mullee's step of collecting the contaminants is a trivial step that is to be done in order to analyze the content, and hence, is inherent to the analyzing step performed by Mullee, as demonstrated by the results listed in Table I, II, and III, as already recited in the previously Office Action.

In particular, it is neither novel nor inventive for one of ordinary skill in the art at the time of Applicant's invention to specifically carry out Mullee's method of removing contaminants from a wafer's edge using organic solvents and collecting the contaminants for further analysis, as described in Mullee's disclosure and already brought up in the previous Office Action.

Furthermore, it is neither novel nor inventive to modify Gilton's method of analyzing a wafer by vertically rotating the wafer having its edge dipping into a solvent, even without Woo et al. as a third prior art. Motivation and teaching are not necessary in this case, since the Examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art(s) (in this case Gilton's and Woo's, while further combining with & modifying by Mullee's) to produce the claimed invention, where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

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This relates to suggestion/motivation in that "having established that this knowledge was in the art, the Examiner could then properly rely ... on a conclusion of obviousness 'from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference'." *In re* Bozek, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969). For example, one does not need any skill in the art to know how to inspect an old-fashioned automobile or bicycle tire-tube for possible air leak by dipping an edge of the tire-tube into water and vertically rotating the tire-tube to inspect the whole tire. One of ordinary skill in the art would certainly be inspired by that unskilled knowledge to combine Mullee's with Gilton's and Woo's, while further modifying by general knowledge in the art of vertically rotating the wafer to produce the claimed invention.

Communication

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bernard E Souw whose telephone number is 703 305 0149. The examiner can normally be reached on Monday thru Friday, 9:00 am to 5:00 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R Lee can be reached on 703 308 4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872 9318 for regular communications and 703 872 9319 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

bes
August 13, 2003


BRUCE ANDERSON
PRIMARY EXAMINER